FO-244.06

GUIDELINES FOR SELECTION OF QUALITY NON-TROUT FISHING LAKES

Under the authority of Section 41103, as amended, being Sections 324.41103 of the Michigan Compiled Laws, the Director of the Department of Natural Resources on November 3, 2005 ordered that this set of criteria be adopted and utilized to determine which inland lakes should have gear restriction regulations applied to them.

INTRODUCTION

Michigan's fishery resources are held in trust by the state for the benefit of its citizens. The mission of the Michigan Department of Natural Resources (DNR), Fisheries Division is to protect and enhance the public trust in populations and habitat of fishes and other forms of aquatic life, and promote optimum use of these resources for the benefit of the people of Michigan. The primary objective for the management of fish populations in inland lakes is to maintain a balanced fish population, meaning they have the capacity to provide a satisfactory harvest of fish in proportion to the productivity of their habitat. In addition, one of the Division's specific goals is: "*to provide diverse public fishing opportunities to maximize the value to fishermen of recreational fishing*". Diverse public fishing opportunities are created in part by managing select inland lakes for quality fishing which includes maximizing the size of fish and the subsequent catch of large fish.

Michigan has a long history of providing "quality" warm and cool water lake angling opportunities for largemouth bass, smallmouth bass, sunfish species, northern pike, muskellunge, and walleye. This has been accomplished primarily through the implementation and enforcement of restrictive angling regulations. Presently there are 71 lakes distributed through 16 counties that are managed with special regulations for quality fishing. These quality fishing opportunities are supported by a complex array of restrictive angling regulations that are directed at reducing or eliminating harvest, restricting gear to minimize angling mortality, and reducing season lengths to maintain high catch rates.

Presently, Fisheries Division has no formal process to incorporate a water body into a Quality Non-Trout Fishing Lake designation. The information presented here was developed as a tool for fisheries managers to use when evaluating cool and warm water lakes for their potential designation as a quality fishing lake. Biological and ecological function of the respective fish species and water body are the basis for these criteria. In addition, other factors such as social considerations, riparian ownership, geographic location, and political concerns must also be included in the evaluation process. These guidelines are intended to identify lakes that have the potential to produce a quality fishery, but screen against lakes with limited potential.

BIOLOGICAL BASIS FOR QUALITY FISHING LAKES GUIDLINES

The potential for a lake to produce large fish is based on three fundamental principles of population dynamics: recruitment, growth, and mortality. Natural reproduction must be adequate to produce enough offspring that are able to survive and thus mortality (natural and fishing) must be low enough so adequate numbers of fish are able to recruit to larger sizes. For populations with high rates of reproduction, mortality rates can be relatively high while still resulting in an adequate number of fish attaining a large size. However, for populations with low rates of reproduction, mortality rates must be quite low for large fish to accrue. Individual fish growth rates also contribute to a lake's potential to produce large fish. All things being equal, a lake will produce more large fish if growth rates are relatively high. However, even lakes with slower growing fish have the potential to produce large, quality-sized individuals if harvest and hooking mortality rates are reduced through restrictive angling regulations.

Focus groups, surveys, and other types of public input indicate that a definition of "quality" fishing is highly variable and depends on individual values. For some, a pristine setting with no shoreline development may provide a quality fishing experience. For others, a quality fishing experience is defined by many large fish. Still others may prefer restricted access that prohibits motorized use or tackle restrictions allowing only artificial lures or flies. Incorporation of all of these values into a single set of recommendations is challenging, and possibly unachievable. Instead of building a single set of regulations or recommendations around the myriad of values, the achievement of quality fishing experiences is proposed through regulations targeted towards specific management goals. These goals are defined by measurable biological parameters with consideration of social factors. These targets will be achieved through the selection of appropriate waters (using recruitment, growth, and mortality parameters), applying appropriate and effective regulations (artificial lures only, limited seasons, limited or no harvest), and providing for adequate follow-up assessment to determine effectiveness.

Managers need tools to assess the current status of a lake relative to the goals of "quality" fishing, and to assess the potential of a lake to produce quality fish in the future. Proportional stock density (PSD) is a tool that can provide information on the current status of a lake, based on the size distribution of fish (Anderson 1976). Proportional stock density (%) is determined from lengths of fish captured in a survey of the fish population through netting or electro fishing. It is equal to the number of fish greater than or equal to the quality stock size divided by the number of fish greater than or equal to the minimum stock size and multiplied by 100.

$$PSD\ (\%) = \frac{\text{number} \geq \text{quality stock size}}{\text{number} \geq \text{minimum stock size}} \times 100$$

Traditionally, "minimum" stock size and "quality" stock size have been defined as a percentage of the total length of the recorded world-record length (Anderson 1976, Anderson and Weitham 1978, Gabelhouse 1984), with "minimum" corresponding to 20-26% of the record length and "quality" corresponding to 36-41%. While anglers may like to catch a fish of quality length, most would prefer to catch something bigger. Therefore, a length categorization system was devised that includes three additional size categories: preferred (45-55% of record length), memorable (59-64%) and trophy (74-80%) size classes (Table 1) (Gabelhouse 1984). To characterize the size distribution of the population relative to these larger size categories, the Relative Stock Density (%) can be calculated (Wege and Anderson, 1978):

$$RSD\ (\%) = \frac{\text{number} \geq \text{stock size (specific length)}}{\text{number} \geq \text{minimum stock size}} \times 100$$

Table 1. Proposed minimum lengths (inches) for five size categories for selected species (Gabelhouse, 1984)

	Size Category (in)				
Species	**Minimum**	**Quality**	**Preferred**	**Memorable**	**Trophy**
Largemouth bass	8	12	15	20	25
Smallmouth bass	7	11	14	17	20
Bluegill	3	6	8	10	12
Black crappie	5	8	10	12	15
White crappie	5	8	10	12	15
Rock bass	4	7	9	11	13
Walleye	10	15	20	25	30
Yellow perch	5	8	10	12	15

Northern pike	14	21	28	34	44
Muskellunge	20	30	38	42	50

For Michigan, the designation of a Quality Non-Trout Fishing Lake will require regulations that are aimed towards producing fish populations that maintain a proportion of preferred and larger fish. Proposed RSD target values (Table 2) for preferred, memorable and trophy categories were derived from fish population data collected from some lakes across the state (Wagner 1988, Schneider and Juetten 1989, Schnieder 2001). These lakes have fish population size structures that are considered representative of a quality fishery. Future validation of the criteria requires that population data from present "Quality Fishing Lakes" to be compiled and compared to validate the values in Table 2.

Table 2. The percentage of fish in netting or electrofishing samples that should be met or exceeded to achieve relative stock density (RSD) target values for quality fishing lake criteria. "Preferred", "memorable", and "trophy" refer to the categories of fish sizes as listed in Table 1.

	Target RSD Values		
Species	**Preferred**	**Memorable**	**Trophy**
Largemouth Bass	60	10	1
Smallmouth Bass	50	15	1
Bluegill	60	5	1
Northern Pike	5	5	1
Walleye	20	5	1

Social and Ecological Considerations for Lake Selection

As previously mentioned, the purpose of this document is to assist fisheries managers in their evaluation of lakes for inclusion in the Quality Non-Trout Fishing Lakes designation. Any prospective water for designation as a Quality Non-Trout Fishing Lake should be reviewed with the following list of considerations. This list identifies attributes of a lake that are associated with a quality fishing experience. A prospective lake does not need to meet all considerations to be included in a Quality Non-Trout Fishing Lake designation as there are many different perceptions about what constitutes a quality fishing experience. But key points regarding the considerations should be clearly articulated in the designation process.

One of the opportunities to designate a Quality Non-Trout Fishing Lake may be found in private lakes being transferred to public ownership. All newly acquired lakes that are contained on lands transferring from private to public ownership and that have not previously been open to public angling should be considered for Quality Non-Trout Fishing Lakes designation. Immediate fishing closures should be imposed to protect the fish community until further evaluation.

- **Access**
  The lake must have public access. Access may be restricted allowing only walk-in or carry-in opportunities to promote non-motorized use but may also include lakes with developed boat access. The type of access to each lake will be designated by the respective land management agency. Watercraft restrictions are encouraged for Quality Non-Trout Fishing Lakes because a pristine and tranquil setting is most often associated with a quality fishing experience.

- **Contaminant Concerns Resulting in Fish Consumption Ban**
  Certain lakes may have fish that contain elevated levels of toxins in their flesh as identified by the Michigan Department of Community Health. This often results in a ban on human consumption of the fish. These lakes are very good candidates for Quality Non-Trout Fishing Lakes designation as the restrictive regulation will further discourage consumptive use of the fish.

- **Frequent Winter-Kill; Greater Than One Year in Every Ten**
  Lakes with frequent winter-kills, defined as more than one event in a ten year period, should not be considered for Quality Non-Trout Fishing Lakes designation. Cool and warm water game fish species have life spans that can exceed ten years. The success of a Quality Non-Trout Fishing Lake designation is dependent on fish achieving a large size which is dependent, in large part, on longevity. Lakes with frequent winter-kill will not be able to produce fish of the desired.

- **Population Dynamics**
  Only lakes that have potential to produce a quality fishery should be considered for inclusion in Quality Non-Trout Fishing Lakes designation. Growth, recruitment, and mortality of the target specie(s) are three biological factors that must be considered in determining if a specific lake can be a candidate. Target species must exhibit adequate growth to allow individuals to attain large size, with adequate recruitment and sufficiently low mortality to allow adequate numbers of fish to survive to older age groups.

  Information on individual growth, recruitment, and mortality should be gathered to determine if any factors are present that would limit the abundance of large fish. It may be difficult to accurately measure recruitment and mortality. The numbers of target individuals (large fish) in the population will most likely be low and difficult to capture which may result in inaccurate estimates and large error bounds.

  Growth of the target species will be evaluated on mean length at age. Fish population age structure will be based on scale or spine samples collected during the survey (Schneider, 2000). A lake may be considered a candidate for inclusion if growth meets or exceeds 90% of the state average total length at age for the respective species (Table 3). If the lake has an unexploited fish community, it may be expected that growth analysis will indicate a slower growing population due to stock piling of larger and older individuals which will result in slower growth and a reduced mean length at age (Schneider and Juetten, 1989).

Table 3. State average total length (inches) by age and month for target fish species. (Schneider, 2000). 90% length value in parenthesis.

Age	Month	Bluegill	Largemouth Bass	Smallmouth Bass	Walleye	Northern Pike
0	Jan-May					
	Jun-Jul					
	Aug-Sep					
	Oct-Dec	1.8(1.6)	4.2(3.8)	3.8(3.4)	7.1(6.4)	11.7(10.5)
1	Jan-May	1.8(1.6)	4.2(3.8)	3.8(3.4)	7.1(6.4)	11.7(10.5)
	Jun-Jul	2.4(2.2)	5.4(4.9)	5.5(5.0)	8.2(7.4)	14.5(13.1)
	Aug-Sep	3.3(3.0)	6.9(6.2)	7.0(6.3)	9.8(8.8)	16.6(14.9)
	Oct-Dec	3.8(3.4)	7.1(6.4)	7.5(6.6)	10.4(9.4)	17.7(15.9)
2	Jan-May	3.8(3.4)	7.1(6.4)	7.5(6.6)	10.4(9.4)	17.7(15.9)
	Jun-Jul	4.2(3.8)	8.7(7.8)	8.8(7.9)	11.4(10.3)	19.0(17.1)
	Aug-Sep	4.7(4.2)	9.3(8.4)	10.1(9.1)	13.3(12.0)	20.1(18.1)
	Oct-Dec	5.0(4.5)	9.4(8.5)	10.8(9.7)	13.9(12.5)	20.8(18.7)
3	Jan-May	5.0(4.5)	9.4(8.5)	10.8(9.7)	13.9(12.5)	20.8(18.7)
	Jun-Jul	5.3(4.8)	10.6(9.5)	11.1(10.0)	14.4(13.0)	21.8(19.6)
	Aug-Sep	5.8(5.2)	11.2(10.1)	12.0(10.8)	15.2(13.7)	22.8(20.5)

	Oct-Dec	5.9(5.3)	11.6(10.4)	12.6(11.3)	15.8(14.2)	23.4(21.1)
4	Jan-May	5.9(5.3)	11.6(10.4)	12.6(11.3)	15.8(14.2)	23.4(21.1)
	Jun-Jul	6.2(5.6)	12.0(10.8)	13.0(11.7)	16.2(14.6)	24.2(21.8)
	Aug-Sep	6.6(5.9)	12.7(11.4)	14.0(12.6)	17.2(15.5)	25.0(22.5)
	Oct-Dec	6.7(6.0)	13.2(11.9)	14.4(13.0)	17.6(15.8)	25.5(23.0)
5	Jan-May	6.7(6.0)	13.2(11.9)	14.4(13.0)	17.6(15.8)	25.5(23.0)
	Jun-Jul	6.9(6.2)	13.7(12.3)	14.7(13.2)	18.0(16.2)	26.1(23.5)
	Aug-Sep	7.1(6.4)	14.4(13.0)	15.2(13.7)	18.6(16.7)	26.9(24.2)
	Oct-Dec	7.3(6.6)	14.7(13.2)	15.3(13.8)	19.2(17.3)	27.3(24.6)
6	Jan-May	7.3(6.6)	14.7(13.2)	15.3(13.8)	19.2(17.3)	27.3(24.6)
	Jun-Jul	7.4(6.7)	15.0(13.5)	15.5(14.0)	19.6(17.6)	27.8(25.0)
	Aug-Sep	7.6(6.8)	16.0(14.4)	16.0(14.4)	20.3(18.3)	28.8(25.9)
	Oct-Dec	7.8(7.0)	16.3(14.7)	16.3(14.7)	20.6(18.5)	29.3(26.4)
7	Jan-May	7.8(7.0)	16.3(14.7)	16.3(14.7)	20.6(18.5)	29.3(26.4)
	Jun-Jul	8.0(7.2)	16.7(15.0)	16.6(14.9)	20.8(18.7)	30.0(27.0)
	Aug-Sep	8.1(7.3)	17.1(15.4)	17.1(15.4)	21.3(19.2)	30.7(27.6)
	Oct-Dec	8.2(7.4)	17.4(15.7)	17.3(15.6)	21.6(19.4)	31.2(28.1)
8	Jan-May	8.2(7.4)	17.4(15.7)	17.3(15.6)	21.6(19.4)	31.2(28.1)
	Jun-Jul	8.4(7.6)	17.6(15.8)	17.4(15.7)	21.7(19.5)	
	Aug-Sep	8.5(7.7)	18.0(16.2)	17.8(16.0)	22.1(19.9)	
	Oct-Dec	8.6(7.7)	18.3(16.5)	18.1(16.3)	22.4(20.2)	
9	Jan-May	8.6(7.7)	18.3(16.5)	18.1(16.3)	22.4(20.2)	
	Jun-Jul	8.7(7.8)	18.6(16.7)	18.3(16.5)	22.6(20.3)	
	Aug-Sep	8.8(7.9)	19.1(17.2)	18.7(16.8)	22.9(20.3)	
	Oct-Dec	8.9(8.0)	19.3(17.4)	18.9(17.0)	23.1(20.8)	
10	Jan-May	8.9	19.3	18.9	23.1	

The proportional stock density index is a tool that can be used to determine if a lake has a balanced population of target fish species that could benefit from more restrictive angling regulations. Lakes with a fish population that do not meet the range of RSD values in Table 2 should not be considered as a candidate unless the population imbalance can be corrected through a cost-effective management action. These management actions will most likely involve restrictive fishing regulations, but may also include population manipulations through manual removal by netting, partial chemical treatments, predatory fish transfers or hatchery stockings. The prescribed management action should not be frequent in nature with expected results to be documented in the 10 year evaluation survey.

If growth rates are near or above the state average, but fishing pressure (and harvest) appears high, then applying the restrictive "quality" regulations will most likely result in an increase in the abundance of "memorable" and larger fish. If recruitment or growth rates are very low or fishing pressure (harvest) are already quite low, then the manager can consider whether other manipulations, such as predator introductions, chemical treatments or manual removals would improve production of the fish population. If a management action can correct the problem, then the lake can then be reconsidered for Quality Non-Trout Fishing Lakes designation. However, if repeated manipulations are required to maintain production of large fish, then the lake is not an appropriate candidate for quality regulations.

Inherent biases are found in calculating RSD values of target species which can be associated with a small population size, sampling gear selectivity, and variations in seasonal catch patterns for various

fish species. The management unit has discretion in determining the amount and type of survey effort needed to quantify and evaluate the size structure of the target species to ensure the derived RSD represents an accurate measure of the target species (Schneider, 2000).

- **Public Support**
  The public (both transient anglers and riparian owners) must fully understand that Quality Non-Trout Fishing Lakes designation will require restrictive angling regulations and compliance with the regulations for success. Without public support, compliance is likely to be inadequate and the restrictive regulations will be ineffective in developing or maintaining a Quality Non-Trout Fishing Lake. The quality fishing regulations will be directed at a reduction in harvest through reduced bag limits, increased minimum size limits, and restricted gear and seasons.

- **Evaluation**
  Follow-up evaluations of designated lakes should be conducted within ten years of the designation. If fish size structure is not conforming to the values established in Target RSD Values (Table 2), a review will be conducted documenting the size structure and all prescribed management action taken to develop a Quality Non-Trout Fishing Lake. If no additional management actions are prescribed, the lake will no longer be designated as a Quality Non-Trout Fishing Lake.

- **Social Political Concerns**
  Angler values have been changing over the past two decades. A growing segment of anglers are willing to reduce or even give up the ability to harvest fish they catch in order to improve the number and size of fish they catch. These trends have been most common with regard to bass and trout angling, but interest is increasing for other species such as muskellunge, northern pike, bluegill, and walleye. Fisheries Division is receiving an increasing number of requests from these anglers to provide more quality angling opportunities. Fisheries managers should seek opportunities that can accommodate these new angling interests while understanding that the majority of the angling public does harvest fish.

PROCESS FOR DESIGNATION

Once a lake has been selected based on the above set of guidelines, the formal designation process must be completed by June 1 for inclusion in the following year's angling regulation package that begins April 1. The first step in this process is the completion of a Status of the Fishery Report and Fisheries Management Plan. The Status of the Fishery Report will identify the attributes associated with the lake and its fish community along with any historical stocking or other management activities. The Fisheries Management Plan will outline the fish community goals for the lake including potential angling regulations and management actions.

Upon completion of a Status of the Fishery Report and Fisheries Management Plan, a public involvement process will be initiated to inform the public of the proposed activities and to determine the level of support for the proposal. This can be accomplished by various means including informational meetings and press releases. If adequate public support is noted, the next step involves completion of the "Fisheries Prescription" process which identifies specific management actions, alternative actions considered, review of the public involvement process and an overall peer review of the proposal with final recommendations. Upon approval of the prescription, the proposal will be incorporated into a fisheries order for presentation at the Natural Resources Commission. With Commission approval, the fisheries order will be signed by the Director and the lake will be formally designated a Quality Non-Trout Fishing Lake and added to the list on Appendix A.

REFERENCES

Anderson, R.O. 1976. Management of small warm water impoundments. Fisheries 1:5-7, 26-28.
Anderson, R.O. 1980. Proportional stock density (PSD) and relative weight (Wr): interpretive indices for fish populations and communities. Practical fisheries management: more with less in the 1980's. Workshop proceedings, New York chapter, American Fisheries Society, Ithaca, New York, USA.
Anderson, R.O., and A. S. Weithman. 1978. The concept of balance for cool water fish populations. American Fisheries Society Special Publication 11:273-283.
Gabelhouse, D.W., Jr. 1984. A length-categorization system to assess fish stocks. North American Journal of Fisheries Management 4:273-283.
Schneider, J.C. and R.P. Juetten. 1989. An evaluation of special fishing regulations on Sylvania Lakes. Michigan Department of Natural Resources Fisheries Research Report 89-9. Ann Arbor.
Schneider, J.C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25. Ann Arbor.
Schneider, J.C. 2001. Evaluation of catch-and-release regulations at Wakeley Lake, 1987-97. Michigan Department of Natural Resources, Fisheries Research Report 2001-2. Ann Arbor.
Wagner, W.C. 1988. Largemouth bass in Michigan's Upper Peninsula lakes. Michigan Department of Natural Resources Fisheries Research Report 1945. Ann Arbor.
Wege, G.J., and R.O. Anderson. 1978. Relative Weight (Wr): a new index of condition for largemouth bass. New approaches to the management of small impoundments. Special Publication 5, North Central Division, American Fisheries Society, Bethesda, Maryland, USA.

Appendix A

QUALITY NON-TROUT FISHING LAKES

The following waters have met the recommended conditions and have been selected for quality non-trout fishing lake regulations. Regulations specific to each waterbody are listed below. No fishing shall be allowed on these waters except as follows:

CRAWFORD COUNTY
Jones Lake (T28N, R2W, Sections 30 and 31): catch and release, artificial lures only. The open season shall be from June 1 to September 30 of each year.

This order shall be assigned number FO-244.06, and is titled "Guidelines for selection of quality non-trout fishing lakes".

This order shall take effect April 1, 2006, and shall remain effective until rescinded.